

## CLAIMS

- 1 1. A device for dithering a three-color source image, comprising:
  - 2 a first logic for dissecting a color space of said source image into a plurality of
  - 3 tetrahedrons each having four vertices;
  - 4 a second logic for locating one of said tetrahedrons that contains a point corresponding to
  - 5 a value of a pixel of said source image;
  - 6 a third logic for generating a random number as a threshold value for dithering said pixel
  - 7 of said source image;
  - 8 a fourth logic for assigning a probability density corresponding to each of said vertex of
  - 9 said located tetrahedron;
  - 10 a fifth logic selecting a vertex as an interim output provided by said threshold value
  - 11 through an inverse probability distribution function derived from said probability densities of
  - 12 said vertices; and
  - 13 a sixth logic for locating an output point in an output color space corresponding to said
  - 14 selected vertex.
- 1 2. A device for dithering a source image according to claim 1, wherein said first logic that
- 2 dissects said color space further comprises:
  - 3 a first logic for truncating said value of said image pixel of said source image, for
  - 4 locating a 3-dimensional cubic subinterval containing said point; and
  - 5 a second logic for further dissecting said 3-dimensional cubic subinterval into a plurality
  - 6 of tetrahedrons.
- 1 3. A device for dithering a source image according to claim 1, wherein said logic for
- 2 generating a random number is a 2-dimensional array of pseudo-random numbers overlaying on
- 3 top of said source image.

1 4. A device for dithering a source image as recited in claim 1, further comprising a seventh  
2 logic containing one-dimensional look-up tables for converting an 3-component input colorant  
3 value into said pixel value.

1 5. A device for dithering a source image as recited in claim 1, wherein the device is  
2 embedded in a central processing unit in a computer system.

1 6. A device for dithering a source image as recited in claim 1, wherein said device is  
2 embedded in a processor in an output device.

1 7. A device for dithering a source image as recited in claim 6, wherein said output device is  
2 a printer.

1 8. A device for dithering a source image as recited in claim 6, wherein said output device is  
2 a display monitor.

1 9. A method for dithering a three-color source image, comprising the steps of:  
2 dissecting a color space of said color image into a plurality of tetrahedrons each having  
3 four vertices;  
4 locating one of said tetrahedrons that contains a point corresponding to a value of a pixel  
5 of said source image;  
6 generating a random number as a threshold value for dithering the said pixel value of said  
7 source image;  
8 assigning a probability density corresponding to each of said vertex of said located  
9 tetrahedron;  
10 selecting a vertex as an interim output provided by said threshold value through an  
11 inverse probability distribution function derived from said probability densities of said vertices;  
12 and  
13 locating an output point in an output color space corresponding to said selected vertex.

1 10. A method for dithering a source image according to claim 9, wherein said method that  
2 dissects said color space comprises the further steps of:

3 truncating said value of said image pixel of said source image, for locating a 3-  
4 dimensional cubic subinterval containing said point; and

5 further dissecting said 3-dimensional cubic subinterval into a plurality of tetrahedrons.

1 11. A method for dithering a source image as recited in claim 9, further comprising the steps  
2 of:

3 converting an input colorant value into said pixel value through one-dimensional lookup  
4 tables, prior to said step of locating a tetrahedron.

1 12. A method for dithering a source image according to claim 9, wherein the step of  
2 generating a random number includes the step of fetching a pseudo-random number from a 2-  
3 dimensional threshold array overlaying on top of said source image.

1 13. A device for dithering a source color image via weighting coefficients associated with a  
2 plurality of sample points in a source color space of said source color image, comprising:

3 a first logic for generating said weighting coefficients of said sample points, wherein said  
4 weighting coefficients are probability densities of said sample points;

5 a second logic for generating a random number as a threshold value for dithering a pixel  
6 value of said source image;

7 a third logic selecting a point from said plurality of said sample points provided by said  
8 threshold value through an inverse probability distribution function derived from said weighting  
9 coefficients of said points; and

10 a fourth logic for locating an output point in an output color space corresponding to said  
11 selected point.

1 14. A device for dithering a source image according to claim 13, wherein said logic for  
2 generating a random number is a 2-dimensional threshold array overlaying on top of said source  
3 image.

1 15. A device for dithering a source image as recited in claim 13, further comprising a fifth  
2 logic containing look-up tables for converting an input colorant value into said pixel value.

1 16. A device for dithering a source image as recited in claim 13, wherein the device is  
2 embedded in a central processing unit in a computer system.

1 17. A device for dithering a source image as recited in claim 13, wherein said device is  
2 embedded in a processor in an output device.

1 18. A device for dithering a source image as recited in claim 17, wherein said output device  
2 is a printer.

1 19. A device for dithering a source image as recited in claim 17, wherein said output device  
2 is a display monitor.

1 20. A method for dithering a source color image via weighting coefficients associated with a  
2 plurality of sample points in a source color space of said source color image, comprising the  
3 steps of:

4 generating said weighting coefficients of said sample points, wherein said weighting  
5 coefficients are probability densities of said sample points;

6 generating a random number as a threshold value for dithering a pixel value of said  
7 source image;

8 selecting a point from said plurality of said sample points provided by said threshold  
9 value through an inverse probability distribution function derived from said weighting  
10 coefficients of said points; and

11 locating an output point in an output color space corresponding to said selected point.

1 21. A method for dithering a source image according to claim 20, wherein the step of  
2 generating a random number includes the step of fetching a pseudo-random number from a 2-  
3 dimensional threshold array overlaying on top of said source image.